

E. Chase
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PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Hiroshi HIGUCHI, et al.

Appln. No.: 08/898,853 ✓

Filed: July 25, 1997

For: MULTI-PIECE SOLID GOLF BALL



Group Art Unit: 3711

Examiner: G. Marlo

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TECHNOLOGY CENTER 3700

RESPONSE TO PTO COMMUNICATION UNDER 37 C.F.R. § 1.111

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

In response to the Communication dated December 1, 1998 the applicants respond to provide the Examiner the additional analysis demonstrating why there is no inherent characteristics in the applied prior art sufficient to maintain the rejections. **Please note that since the due date fell on a holiday, the filing of this response on January 4, 1999 is sufficient.**

As discussed in the last response and as described in the present specification, the golf ball of the invention uses a two-layer cover wherein the outer cover layer has a hardness of 40 to 60° on the Shore D scale and the inner cover layer has a hardness of up to 53° on the Shore D scale. Importantly, the hardness of the inner cover is lower than that of the outer cover layer.

Differently stated, inside a soft outer cover layer a softer inner cover layer is formed. This is one of the claimed features of the invention. When the ball having the inner cover layer

which is softer than the outer cover layer, which is soft in itself, is subject to a driver shot providing a great value of F/N indicating that the perpendicular force F is greater than the parallel force N , a compressive force acts on the inner cover layer to a greater extent and a force in a shearing direction is smaller than the compressive force. Those are the force dynamics of a ball with this construction. The result is an improvement in "feel". Since soft layers are provided in the compression direction, the feel upon hitting is very soft and comparable to the feel of the wound balatta golf ball.

Additionally, since the force in the shearing direction is small, the reaction force at the same location of contact is small enough to restrain excess spinning. This ensures a low spin, flat and long-extending ball trajectory and carry that is the inherent quality of solid golf balls.

The case of a club having a greater loft presents different dynamic conditions. Here, the force in a shearing direction increases relative to the compressive force. Since the inner cover layer is formed as a softer layer, the amount of local deformation in a shearing direction increases in response to the shearing force. This restrains the slip phenomenon which is the drawback inherent in solid golf balls. The resultant spin performance is approximate to that of the wound golf ball rather than the prior art solid golf balls. Thus the ball can appropriately respond to shots by both drivers and lofted clubs.

In addition to the structure of the cover, consisting of two layers, the golf ball of the invention is structured to comprise at least four layers since the core consists of at least two layers. The ball thus has improved restitution or repulsion. More particularly, the use of a soft material as a ball component generally tends to lower restitution to reduce a carry. By forming the core as a multi-layer structure having two or more layers, restitution is improved due to the embracement effect of the respective layers as compared with a single layer structure core of the

same softness, ensuring a satisfactory carry. The multi-layer core consisting of an inner sphere and a layer surrounding the inner sphere wherein the inner sphere is formed softer than the surrounding layer is improved in hitting feel or affords a softer hitting feel.

As claimed, the golf ball comprising at least four layers wherein the cover has a two layer structure consisting of a soft outer cover layer and a softer inner cover layer provides spin performance approximate to that of the wound golf ball rather than the prior art solid golf balls designed in pursuit of spin performance while maintaining the flying performance inherent to solid golf balls. That is, this invention produces a golf ball which has advantages of both solid golf balls and wound golf balls.

The Specification discloses the details beginning at page 6, line 30 to page 7, line 25. In the core 11, the inner sphere 12 preferably has a Shore D hardness of 20 to 55 degrees, especially 25 to 50 degrees and a distortion of 2.6 to 8.7 mm, especially 3.5 to 7.7 mm under a load of 100 kg. If the inner sphere 12 has a too low hardness, restitution would be lost, failing to provide satisfactory flying performance. If the inner sphere 12 has a too high hardness, the feel would be exacerbated. The inner sphere 12 should preferably have a diameter of 20 to 39 mm, especially 25 to 38 mm since it has a substantial influence on feel when using a driver.

Like the core of prior art two-piece solid golf balls, the inner sphere 12 may be formed of a rubber material based on polybutadiene which is vulcanized with an organic peroxide with the aid of a cross linking agent such as zinc (meth)acrylate.

The surrounding layer 13 around the inner sphere 12 preferably has a hardness of at least 45 degrees especially at least 55 degrees on Shore D. If the surrounding layer's hardness is less than 45 degrees, restitution would be reduced. For providing a better feel, the surrounding layer

13 should preferably have a hardness of up to 80 degrees, especially up to 75 degrees on Shore D. It is preferred that the hardness of the surrounding layer 13 be greater than the hardness of the inner cover layer 15. Also, the hardness of the surrounding layer 13 should be greater than the hardness of the inner sphere 12 for compensating for the short restitution of the very soft inner sphere 12.

Preferably the surrounding layer 13 has a gage of 1.0 to 10 mm, especially 1.0 to 8 mm and the core 11 has a diameter of 35 to 41 mm, especially 36 to 40 mm. If the surrounding layer 13 is too thin, restitution would be insufficient. If the surrounding layer 13 is too thick, the hitting feel would be exacerbated.

Given this understanding of the claimed invention it is submitted that the cited references do not expressly or inherently provide the claimed characteristics. Sun fails to disclose and teach the subject matter and the feature of the present invention discussed above. Sun discloses a multi-section golf ball, comprising in combination: a) first, second, third, and fourth ball sections each having a spherical outer surface, and all sections having a common center, b) the first section being an inner core closest to said center and consisting of substantially incompressible material, c) the second section being an intermediate core in the form of a shell surrounding said inner core, the second section consisting essentially of carbonaceous material, d) the third section being an outer core in the form of a shell surrounding said intermediate core, the third section consisting essentially of an elastomer, e) the fourth section being a cover in the form of a shell surrounding said outer core, f) whereby the radius of gyration and spin rate of the golf ball can be controlled by selection of the weight, density, and size of each of the first, second and third sections.

Sun discloses an incompressible material and the carbonaceous material, for example:

The first section 11, closest to the center 15, consists of substantially incompressible material, examples being steel, zinc, water, mercury, and other solids and liquids, metallic or non-metallic. The density range of such material lies between 0.4 to and 4.0 grams per cubic centimeter. If the inner core 11 is a spherical solid, the intermediate core 12 may be molded about the core 11 and bonded thereto during molding. If the core 11 is a liquid, it may be injected into the hollow formed by the core 12 and bounded by the inner surface 11b of the latter.

The intermediate core 12 is in the form of a shell surrounding the inner core and having a constant radial dimension between its inner and outer surfaces. The intermediate core 12 consists essentially of carbonaceous material, one example being reinforced carbon graphite. Such graphite may have been preliminarily shaped in the form as shown and, under suitably high pressure and temperature, to provide a graphitic body, the latter then being cut in half to allow its reception of the inner core 11 therein, that inner core being a solid, in the form of a ball. The two halves of the intermediate core 12 are then bonded together as at interfaces 12c and 12d, employing a suitable adhesive. This step of forming the combined assembly 11 and 12 is indicated at 20 in FIG. 2 in Sun.

In the present invention, in contrast, the inner sphere which corresponds to the first section of Sun is not formed of an incompressible material but formed of a compressible material, i.e. a rubber material based on polybutadiene. Furthermore, the surrounding layer of the present invention which corresponds to the second section of Sun is not formed of a carbonaceous material but formed of a thermoplastic resin or rubber base material.

As discussed above, the use of a soft material as a ball (or core) component generally tends to lower restitution to reduce a carry. By forming the core as a multi-layer structure having two or more layers, restitution is improved due to the embracement effect of the respective layers as compared with a single layer structure core of the same softness, ensuring a satisfactory carry. The multi-layer core consisting of an inner sphere and a layer surrounding the inner sphere wherein the inner sphere is formed softer than the surrounding layer is improved in hitting feel or affords a softer hitting feel.

Since the core, especially the first section of the golf balls according to Sun is not a compressible material or rubber material, the claimed construction is not anticipated by Sun, either expressly or inherently. Simply put, the configuration is opposite to that defined by Applicants..

Furthermore, although the third and fourth sections of the Sun golf ball may correspond to the inner and outer cover layers of the present golf ball, Sun fails to disclose and teach that the outer cover layer should have a Shore D hardness of 40 to 60 and the inner cover layer should have a Shore D hardness of up to 53 and lower than that of the outer cover layer in combination with the present core structure, whereby a multi-piece solid golf ball will travel a satisfactory carry as inherent to solid golf balls when shot with a driver, receives more spin when shot with an iron, and has controllability closer to the wound balata golf ball.

Sun is silent in the relationship between the hardnesses of the outer and inner cover layers, and the feature of the presently claimed invention described above. No inherency can be inferred from that lack of disclosure.

Higuchi '311 is no more pertinent and does not define a golf ball having either the express or inherent features of the claimed invention. It discloses a multi-piece solid golf ball comprising; a solid core of a multi-layer structure including innermost core and at least one intermediate layer enclosing the innermost core, and a cover enclosing the solid core, said golf ball having a specific gravity of 1.0 to 1.1, a weight of 40.8 to 44.9 g and a A distortion under a load of 100 kg. The innermost core has a distortion of B mm under a load of 100 kg, wherein B/A ranges from 1.2 to 1.7. The cover has a shore D hardness of at least 50 and a greater hardness than the hardness of the innermost core.

The object of the Higuchi invention is to provide a novel and improved multi-piece solid golf ball which is increased in flying distance and gives a pleasant feel when those golf players who have slow club head speed, including beginner, female and senior players. Higuchi discloses that ordinary golf balls are designed optimum for experienced and professional golfers capable of high head speed swing. When a player who swings at a slow head speed of less than 40 in/sec hits such an ordinary golf ball with a driver, the ball will frequently follow a low trajectory, failing to fly a satisfactory distance. Since the ball of Higuchi made lightweight to increase its lift by reducing its specific gravity in the range of 1.0 to 1.1 g/cm³ below the specific gravity level of ordinary balls, the ball tends to fly high and gain a higher initial velocity even at a low head speed, covering a longer flying distance. By controlling the ratio of the distortion B (mm) of the innermost core to the distortion A (mm) of the ball to fall in the above-defined range, the ball is improved in feeling, that is, gives a pleasant feel, soft and light impact upon hitting, and when hit at a low head speed, yields a sufficient amount of deformation to improve its flying performance and travel an increased flying distance. By increasing the cover hardness within a permissible range, the ball becomes more durable.

Accordingly, the object and the effect of Higuchi is different from those of the present invention. Higuchi fails to disclose and teach the presently claimed invention by which a multi-piece solid golf ball will travel a distance comparable to conventional solid golf balls and have spin receptivity approximate to that found with wound golf balls.

The Examiner should note that the golf ball of Higuchi is directed to those golf players who swing at a relatively low head speed. In fact, the flying distance is evaluated by hitting a ball with a driver at a head speed of 40 m/sec or 35 m/sec in Examples of that patent.

On the other hand, the golf ball of the present invention is directed to skilled golfers as is supposed from the description of Prior Art of the present specification and the object of the present invention. In fact, the flying distance is evaluated by hitting a ball with a driver at a head speed of 45 m/sec. Therefore, the present invention is not anticipated from Higuchi and the disclosure does not define a golf ball having inherent features rendering the claims unpatentable.

Therefore based on this response, coupled with Applicants prior response to the outstanding Office Action, it is respectfully submitted that the application is in a condition for allowance. Should the Examiner have any questions he is invited to call the undersigned attorney of record at the local exchange listed below.

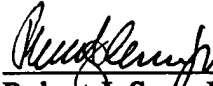
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U.S. Appln. No. 08/898,853

Applicant hereby petitions for any extension of time which may be required to maintain the pendency of this case, and any required fee, except for the Issue Fee, for such extension is to be charged to Deposit Account No. 19-4880.

Respectfully submitted,

SUGHRUE, MION, ZINN,
MACPEAK & SEAS, PLLC
2100 Pennsylvania Avenue, N.W.
Washington, D.C. 20037-3213
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

for


Robert J. Seas, Jr.
Registration No. 21,092
Neil B. Siegel
Registration No. 25,200

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